

The Bud Ervin Water Treatment Plant :

- ... currently provides up to **45.5** million gallons of water per day.
- ... is planned to provide a future capacity of approximately **61** million gallons per day.
- ... treatment process is **fully automated**. The water treatment plant can be monitored and controlled via SCADA software.
- ... utilizes the **latest proven technologies**:
 - Pressurized Membrane Filtration
 - Advanced UV Oxidation with Hydrogen Peroxide
 - On-site Sodium Hypochlorite Generation
- ... employs a **multiple barrier** approach regarding disinfection.
- ... is supplied with raw water by the Tarrant Regional Water District (TRWD), which include the Richland-Chambers, Cedar Creek, and Benbrook Reservoirs.
- ... is a **regional** water supplier.



A view inside the membrane building



UVAOP Reactor



High service pumps



Clearwell No. 2



BUD ERVIN WATER TREATMENT PLANT
707 Pleasant Ridge Court
Mansfield, Texas 76063
817.477.2248



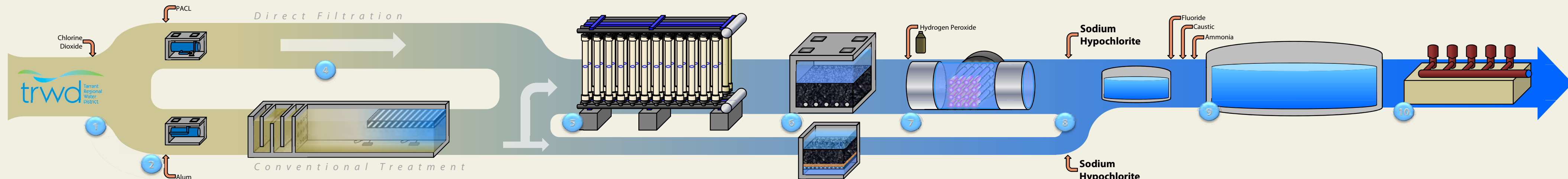
1320 S. University Drive, Suite 300
Fort Worth, Texas 76107
817.806.1700



BUD ERVIN WATER TREATMENT PLANT

707 Pleasant Ridge Court





1 CHLORINE DIOXIDE

What is chlorine dioxide?

Chlorine dioxide is a powerful oxidant that is generated onsite by mixing sodium chlorite and chlorine. The water treatment plant feeds chlorine dioxide to oxidize iron and manganese that naturally exists in the water. After the iron and manganese have been oxidized, they are easier to settle out in the sedimentation basins. While iron and manganese are not regulated from a health standpoint, both can lead to staining of bathroom fixtures, laundry, etc.

2 HYDRAULIC MIXING AND COAGULATION

What does hydraulic mixing do?

The plant utilizes hydraulic mixing via pressurized water. This pressurized water exits a nozzle faced opposite the flow path, creating a turbulent mixing zone. Aggressive mixing ensures an even distribution of the chemicals in the water. The purpose of hydraulic mixing is to “flash mix” the coagulation chemical into the raw water to enhance the effectiveness of the downstream treatment processes. Coagulation chemicals neutralize the charge of particles in the water and make them “sticky.”



Sedimentation basins

3 FLOCCULATION AND SEDIMENTATION

What does flocculation do?

Flocculation causes coagulated suspended particles to collide and stick together, creating a fragile cluster known as “floc.” These larger particles are heavier and will fall out of suspension during the sedimentation process.

How does one flocculate?

Water is gently agitated as it moves through the flocculation zones. The gentle agitation encourages particles to collide into one another and stick together. It is important not to agitate the water too aggressively, or the floc particles will break up. The larger the floc particles, the more effective the sedimentation stage will be. It takes about 30 minutes for water to flow through the flocculation stage.



“Rocking Arm” flocculators

Sedimentation

The sedimentation basins provide a place for the flocculated particles to settle out of the water. Any oxidized iron and/or manganese also settle out in these basins.

How does a sedimentation basin work?

The sedimentation basin is essentially a wide spot in the treatment plant. As the water flows into the basins, the speed and force of the water decreases and the water becomes quiescent. By slowing down the water, the heavy floc particles are no longer carried through the basin but instead begin to settle out of suspension and accumulate on the floor of the basin. The settled floc forms a fluffy layer of sludge at the bottom of the basin, which is gently removed and disposed of. The cleaner water at the top is continuously collected and sent to the next treatment unit. It takes approximately 90 minutes for water to move through the entire basin.

4 DIRECT FILTRATION

What is direct filtration?

Typically, water flows through the conventional treatment stage before membrane filtration. However, the plant has the ability to operate in “direct filtration” mode. Should demand increase beyond the capacity of the conventional treatment train, raw water can flow directly to membrane filtration. This mode allows the membranes and conventional treatment train to operate in parallel, providing additional capacity during periods of high demand.

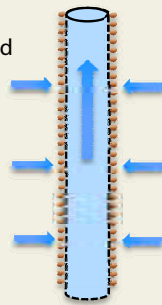
5 MEMBRANE FILTRATION

What is membrane filtration?

Membrane filtration is a relatively new technology to municipal water treatment. A membrane system is comprised of thousands of tiny porous tubes, called fibers. The walls of each tube are filled with many microscopic holes that are only 0.1 micrometers in diameter. These tubes are tightly bundled together to form a long cylinder called a module. There are currently 630 modules in use at the plant.

How does membrane filtration work?

The water treatment plant utilizes pressurized membrane filtration. Water is forced inside the tube through the pores in the tube wall, rejecting any particles or microorganisms larger than the pores. Once through the tube wall, the filtered water heads up and out the top of the tubes and into a collection header where it is pumped to the next stage of treatment.



What does membrane filtration do?

Membrane filtration provides a physical barrier to microscopic pathogens such as *Giardia lamblia* and *Cryptosporidium*. It also significantly improves the clarity of the water by removing almost all particulates.

Surface area

Currently, the water treatment plant utilizes 5 membrane racks with 126 modules each for a total of 630 modules. If one were to unroll every membrane tube and lay them flat, side by side, they would cover almost six football fields!

Micrometer?

One micrometer is one millionth of a meter; this is about 50 times smaller than the average human hair.



The inside of a module, showing the hollow membrane fibers

6 GAC CONTACTOR

What does GAC do?

Granular activated carbon (GAC) contactors improve the taste, odor, and clarity of the water. GAC removes some of the organic compounds that might make the water taste or smell undesirable.

GAC?

GAC are small pellets of activated carbon. Activated carbon is produced by the carbonization and oxidation of a raw material, typically wood peat, lignite, or bituminous coal. Activated carbon is a similar technology used in many home water filters you might use on your tap or find in your refrigerator.

How does GAC work?

GAC is an extremely porous material. Just four grams of GAC have an equivalent surface area of one acre or about the area of a football field. As water passes down through the GAC media, organic contaminants in the water adsorb into the porous GAC. As the pores become filled with organic material, the GAC becomes expended over time. Once the useful life of the GAC has been expended, it will have to be replaced. Typically, GAC media lasts about three years. It takes less than 15 minutes for the water to pass through the GAC contactors.

7 ULTRAVIOLET ADVANCED OXIDATION PROCESS (UVAOP) WITH HYDROGEN PEROXIDE

What does UVAOP do?

The main purpose of UVAOP is to improve taste and odor. In addition to taste and odor control, the UV/peroxide system oxidizes and treats the water for dissolved organic compounds in the water and other microconstituents. UV light may also be used by the plant to provide additional inactivation of *Cryptosporidium* and *Giardia lamblia* should the need arise.

UVAOP?

Ultraviolet advanced oxidation with hydrogen peroxide is a relatively new process for disinfection and taste and odor control. It utilizes intense ultraviolet light and hydrogen peroxide to treat the water.

SODIUM HYPOCHLORITE

How does UV oxidation work?

First, hydrogen peroxide is added to the water just prior to reaching the UV light chamber. As water flows through the array of bulbs, the intense dose of UV light on the hydrogen peroxide produces strong oxidizing radicals, known as hydroxyl radicals. These powerful oxidizing hydroxyl radicals break the bonds between molecules, leaving behind only inert, elemental compounds. Should the need arise, the intense UV light can be used to disrupt the DNA of many pathogens, disabling their ability to reproduce and make you sick.

Powerful lamps

The lamps in the UV oxidation system are very powerful and emit extremely intense UV light. There are sixteen 12.5-kW lamps in each UV reactor. One UV lamp is about 100 times more powerful than your average tanning bed lamp. It would sunburn your skin in a matter of seconds!

8 SODIUM HYPOCHLORITE GENERATION

What does sodium hypochlorite do?

Sodium hypochlorite is used as the primary disinfectant. When mixed with the water, it inactivates many potentially harmful microorganisms.

Sodium hypochlorite?

Sodium hypochlorite is chemically the same as household bleach but is generated in a lower concentration than you might find under your sink. Because

the sodium hypochlorite generated onsite is of very low concentration (0.8%), it is considerably less dangerous to transport and store onsite than the chlorine gas traditionally used in water treatment.



Sodium Hypochlorite generator

How is sodium hypochlorite generated?

Sodium hypochlorite is made from very simple components. It is made of the same elements found in water (H₂O) and common table salt (NaCl). To generate sodium hypochlorite, you first combine water and salt to form a mixture known as brine and then pass an electrical charge through the brine solution.



9 CLEARWELL STORAGE

What does the clearwell do?

The clearwell provides onsite storage of the treated water before it is pumped to the distribution system. It also acts as a buffer between the water plant and the distribution system.

A clearwell?

A clearwell is simply a large inline storage tank between the water treatment plant

and the high service pump station. The clearwells at the plant hold a combined total of 2.5 million gallons, which is more than four Olympic swimming pools' worth of water!

How does a clearwell work?

Water demand is constantly changing throughout the day, with the highest usage occurring during the morning and evening hours. In order for the plant to operate efficiently, the production rate is not varied as widely as the demand. The clearwell solves this problem by storing enough treated water on site to satisfy the peak demand. As demand increases the level in the clearwell falls; the level increases during the off peak hours.

10 HIGH SERVICE PUMP STATION

What does the high service pump station do?

The high service pump station pumps water to the distribution system and ultimately to your tap.

What is a high service pump station?

A high service pump station is characterized by the large amount of power required to drive the pump due to the high pressures it must overcome. It requires multiple pumps arranged in parallel, all working together to push water through the distribution system. The most powerful high service pump at the plant is driven by a 500-horsepower electrical motor.